

(12) **United States Patent**
Johnson

(10) **Patent No.:** **US 10,813,412 B2**
(45) **Date of Patent:** **Oct. 27, 2020**

(54) **SPIKE FOR FOOTWEAR HAVING RIGID PORTION AND RESILIENT PORTION**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 394 days.

(21) Appl. No.: **14/943,640**

(22) Filed: **Nov. 17, 2015**

(65) **Prior Publication Data**
US 2016/0128431 A1 May 12, 2016

Related U.S. Application Data
(62) Division of application No. 13/472,037, filed on May 15, 2012, now Pat. No. 9,220,319.

(51) **Int. Cl.**
B29B 11/08 (2006.01)
A43C 15/16 (2006.01)
B29B 11/14 (2006.01)
B29D 1/00 (2006.01)
B29D 35/00 (2010.01)
B29D 35/14 (2010.01)
A43C 15/02 (2006.01)
B29K 19/00 (2006.01)
B29K 77/00 (2006.01)

(52) **U.S. Cl.**
CPC *A43C 15/168* (2013.01); *A43C 15/02* (2013.01); *A43C 15/16* (2013.01); *A43C 15/165* (2013.01); *A43C 15/167* (2013.01); *B29B 11/08* (2013.01); *B29B 11/14* (2013.01); *B29D 1/00* (2013.01); *B29D 35/0009*

(2013.01); *B29D 35/14* (2013.01); *B29K 2019/00* (2013.01); *B29K 2077/00* (2013.01)

(58) **Field of Classification Search**
CPC *A43B 5/001*; *A43B 23/20*; *A43B 5/02*; *A43C 15/16*; *A43C 15/162*; *A43C 15/165*; *A43C 15/167*; *A43C 15/168*; *A43C 15/02*
See application file for complete search history.

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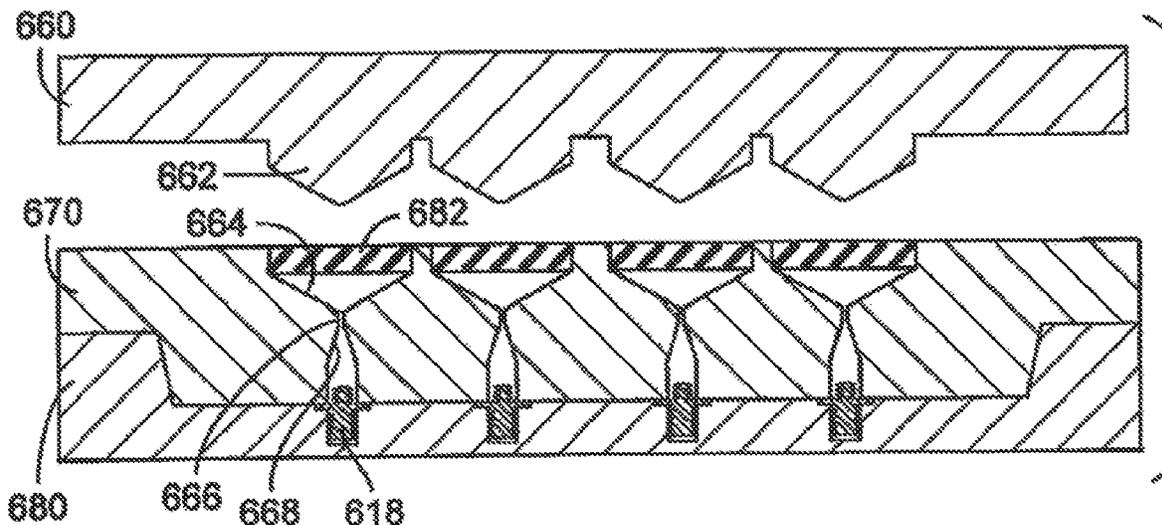
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(57) **ABSTRACT**
A spike is operable to be removably coupled to an article of footwear. The spike includes a first portion that is substantially rigid. The spike also includes a second portion that is resilient.

20 Claims, 3 Drawing Sheets



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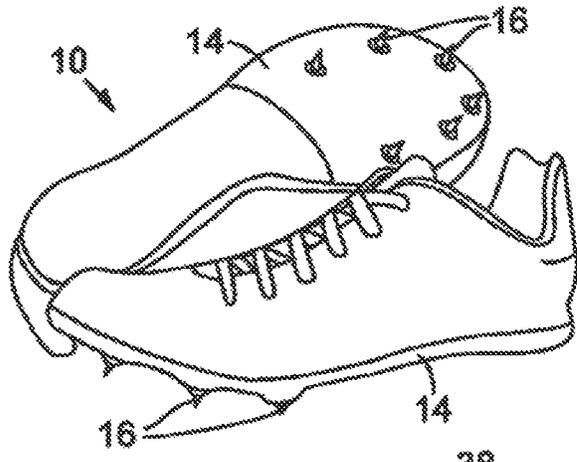


FIG. 1

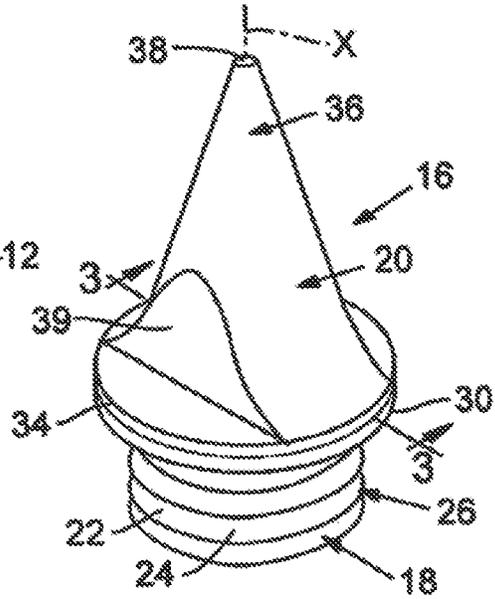


FIG. 2

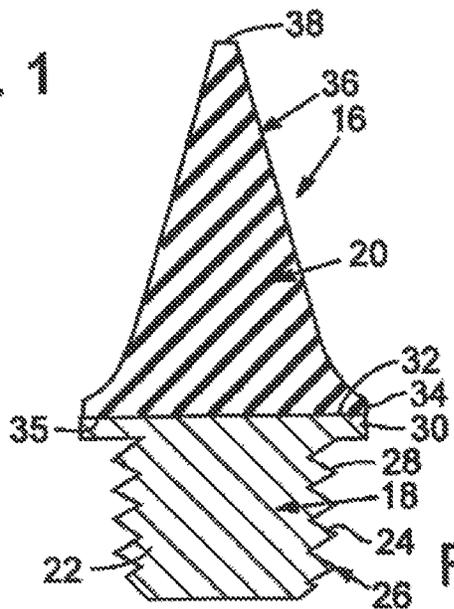


FIG. 3

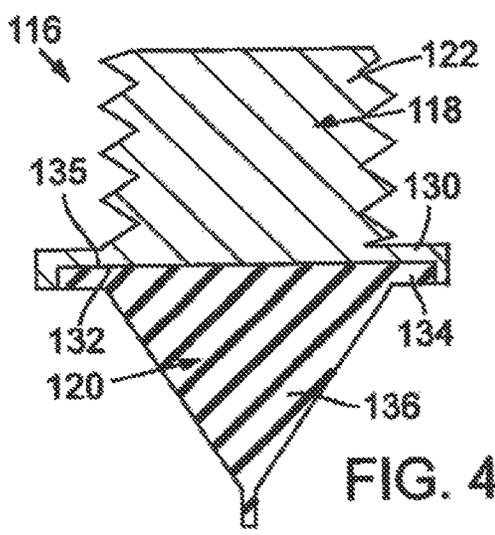


FIG. 4

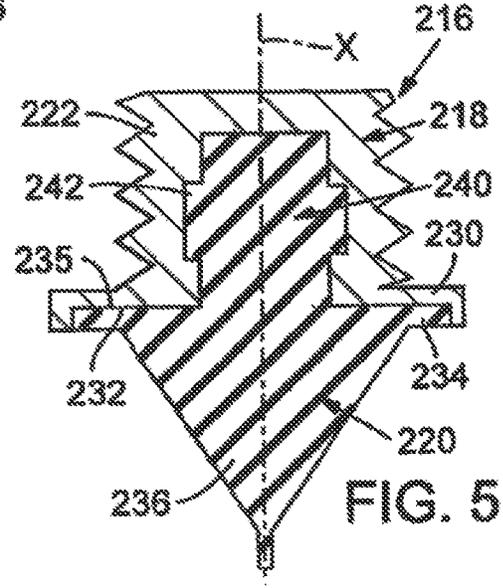


FIG. 5

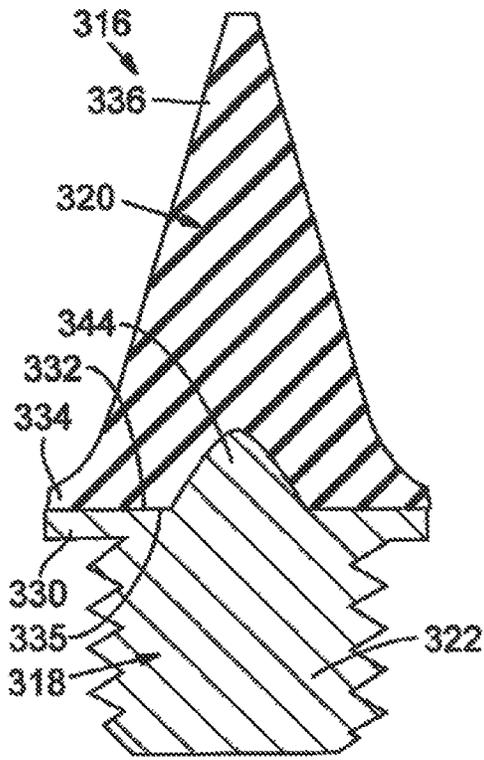


FIG. 6

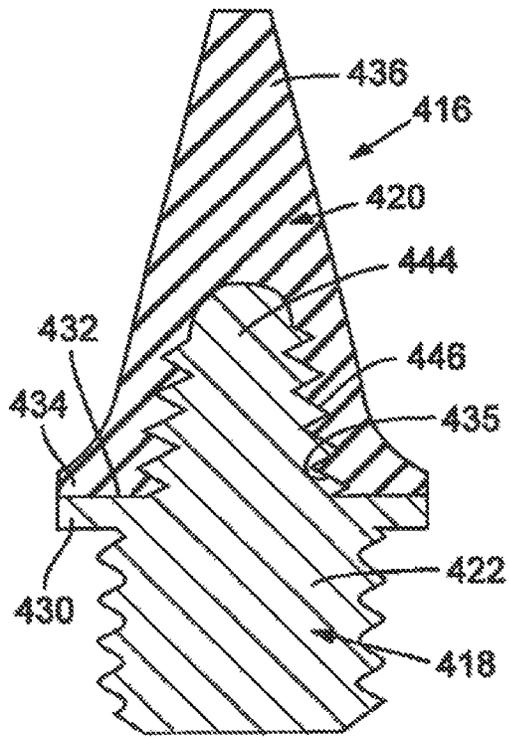


FIG. 7

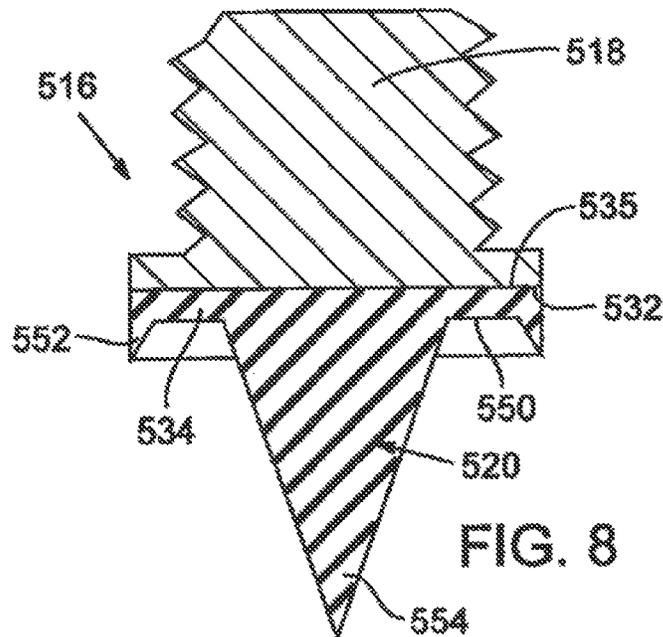
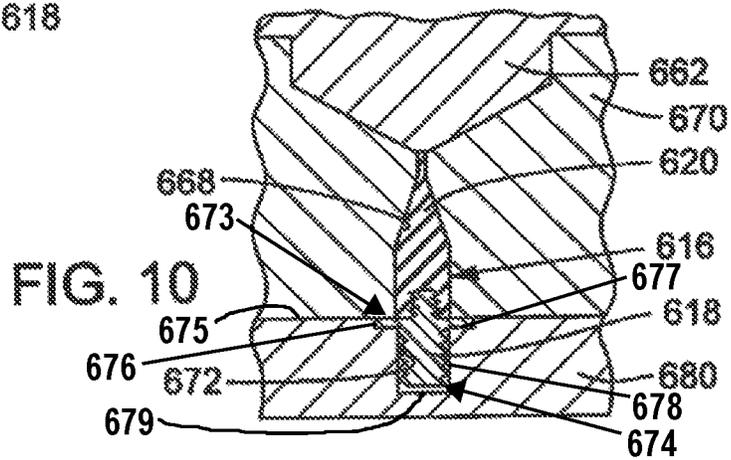
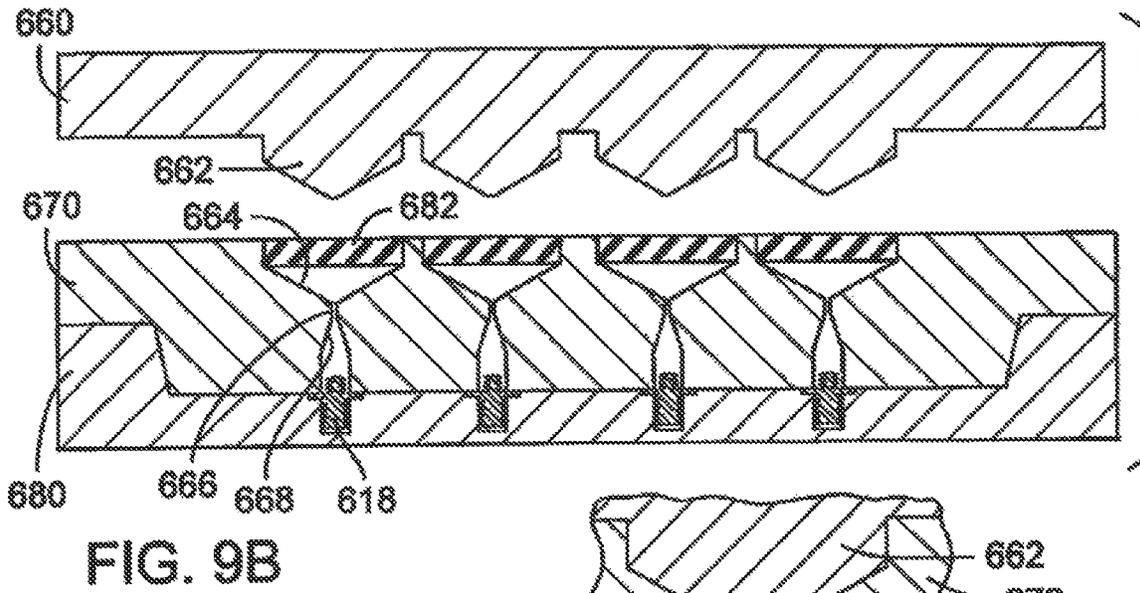
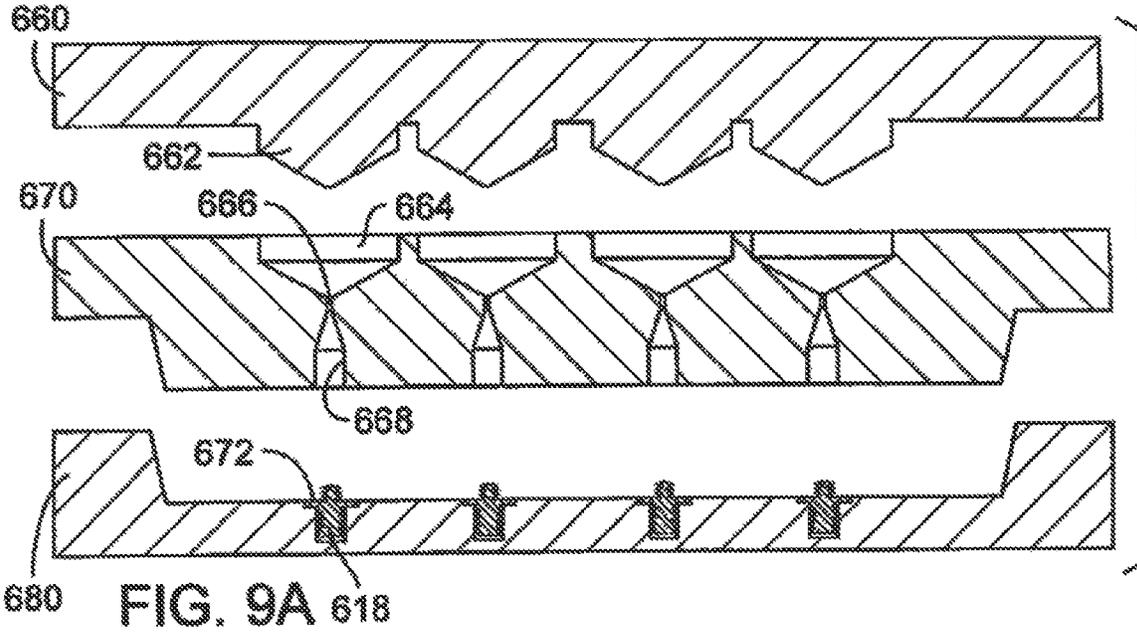


FIG. 8



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SPIKE FOR FOOTWEAR HAVING RIGID PORTION AND RESILIENT PORTION

CROSS-REFERENCE TO RELATED APPLICATION

This application is a divisional of co-pending application Ser. No. 13/472,037, filed May 15, 2012, the disclosure of which is hereby incorporated by reference in its entirety.

FIELD

The present disclosure relates to a spike for footwear and, more particularly, to a spike for footwear having a rigid portion and a resilient portion.

BACKGROUND

This section provides background information related to the present disclosure which is not necessarily prior art.

Many types of footwear include spikes that improve traction. For instance, many running shoes include spikes that extend from the sole assembly. The spikes can penetrate into the running surface (e.g., dirt, grass, etc.) for enhancing the wearer's ability to push off from the running surface and improve his or her running performance.

In some cases, the spikes are removably connected to the sole of the footwear. For instance, the spikes can be threadably attached to the sole. Thus, the wearer can interchange the spikes to configure the footwear as desired (e.g., to include spikes of a desired length, width, material, etc.).

Typically, spikes are made of rigid metal. As such, these spikes can readily penetrate into softer running surfaces. However, these spikes are unlikely to penetrate harder surfaces, such as pavement, and the wearer may lose traction on these surfaces. For instance, portions of a single cross country race might be routed over grass, and other portions of the race might be routed over pavement. In this case, spikes would provide traction over the grassy portions of the race, but the spikes could prove to be a disadvantage over the paved portions.

SUMMARY

This section provides a general summary of the disclosure, and is not a comprehensive disclosure of its full scope or all of its features.

A spike is disclosed that is operable to be removably coupled to an article of footwear. The spike includes a first portion that is substantially rigid. The spike also includes a second portion that is resilient.

A method of manufacturing a spike that is operable for removably coupling to an article of footwear is also disclosed. The method includes providing a first portion that is substantially rigid and providing a second portion that is resilient. The method further includes chemically bonding the first and second portions together.

Moreover, an article of footwear is disclosed that includes a sole and a spike. The spike includes a first portion that is substantially rigid and a second portion that is resilient. The first and second portions are chemically bonded together. The first portion is made out of a polyether block amide, and the second portion is made out of carboxylated rubber. The first portion includes a threading for removably engaging with the sole. The second portion extends away from the first

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portion and terminates at a second end. A width of the second portion tapers downward in a direction from the first portion to the second end.

Further areas of applicability will become apparent from the description provided herein. The description and specific examples in this summary are intended for purposes of illustration only and are not intended to limit the scope of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

The drawings described herein are for illustrative purposes only of selected embodiments and not all possible implementations, and are not intended to limit the scope of the present disclosure.

FIG. 1 is a perspective view of a pair of shoes that include spikes of the present disclosure;

FIG. 2 is a perspective view of a spike of the present disclosure;

FIG. 3 is a cross section of the spike taken along line 3-3 of FIG. 2;

FIG. 4 is a cross section of the spike according to additional exemplary embodiments;

FIG. 5 is a cross section of the spike according to additional exemplary embodiments;

FIG. 6 is a cross section of the spike according to additional exemplary embodiments;

FIG. 7 is a cross section of the spike according to additional exemplary embodiments;

FIG. 8 is a cross section of the spike according to additional exemplary embodiments;

FIGS. 9A and 9B are schematic representations of a manufacturing technique for manufacturing the spikes of the present disclosure; and

FIG. 10 is a detail view of a mold cavity for manufacturing the spikes of the present disclosure.

Corresponding reference numerals indicate corresponding parts throughout the several views of the drawings.

DETAILED DESCRIPTION

Example embodiments will now be described more fully with reference to the accompanying drawings.

Referring initially to FIG. 1, exemplary embodiments of articles of footwear 10 are illustrated. The footwear 10 can be running shoes, golf shoes, or any other type of footwear 10 without departing from the scope of the present disclosure. As shown, the footwear 10 can include an upper 12 and a sole 14. The footwear 10 can also include a midsole (not specifically shown), which provides cushioning between the upper 12 and the sole 14. Moreover, the footwear 10 can include one or more spikes 16. The spikes 16 can be operably coupled to the sole 14 and can project therefrom. The spikes 16 can be short and narrow such that the spikes 16 can readily penetrate into the ground, grass, dirt, or other surface upon which the wearer is treading.

In some embodiments, the spikes 16 can be removably coupled to the sole 14 as will be discussed in greater detail below. Thus, the spikes 16 of the footwear 10 can be interchangeable with longer or shorter spikes, with spikes of different materials, etc. However, the spikes 16 could be permanently fixed to the sole 14 in other embodiments without departing from the scope of the present disclosure. Moreover, the spikes 16 could have any suitable shape other than those shown in FIG. 1. In addition, the term "spike" is defined broadly herein to cover spikes, cleats, and other

objects that project from a sole **14** of an article of footwear **10** to improve traction for the wearer.

Referring now to FIGS. 2 and 3, exemplary embodiments of the spike **16** will be discussed in greater detail. The spike **16** can include a first portion **18** and a second portion **20**. The first portion **18** can be removably coupled to the sole **14**, and the second portion **20** can extend and project from the sole **14**. In some embodiments, the first portion **18** can be substantially hard and rigid, and the second portion **20** can be resilient (elastic, resiliently compressible, flexible, etc.). As such, the second portion **20** of the spike **16** can resiliently flex, for instance, when treading on hard surfaces (e.g., concrete, pavement, etc.) such that the wearer is less likely to lose traction. However, the rigidity of the first portion **18** can help the spike **16** to remain attached to the sole **14** of the footwear **10**.

In some embodiments, the first portion **18** of the spike **16** can be made out of polymeric material. For instance, the first portion **18** can be made of a polyether block amide, such as PEBAX™, which is commercially available from Arkema, Inc. The first portion **18** can also be made of nylon or nylon-containing thermoplastic material as well. More specifically, the first portion **18** can contain at least 30% by weight of nylon. Also, it will be appreciated that the first portion **18** could be made out of any other suitable material. The first portion **18** can have a durometer between 40 and 75 on the Shore D scale. In additional embodiments, the first portion **18** can have a durometer between 45 and 85 on the Shore D scale. Accordingly, the first portion **18** can have very high hardness and can behave similar to metal, for instance, to ensure attachment to the sole **14**.

Likewise, in some embodiments, the second portion **20** of the spike **16** can be made out of polymeric material. For instance, the second portion **20** can be made of a rubber, such as carboxylated rubber (i.e., a carboxyl group-containing rubber). More specifically, the second portion **20** can be made of a rubber composition which consists of 100 parts by weight of a carboxyl group-containing rubber, 100-300 parts by weight of fillers, and 1-10 parts by weight of a peroxide as a vulcanizing agent. However, the second portion **20** could be made out of any other suitable material. The second portion **20** can have a durometer between 45 and 95 on the Shore A scale. As such, the second portion **20** can be somewhat hard, but more compliant than the first portion **18**.

Furthermore, the first and second portions **18, 20** can be directly bonded (chemically bonded) together without adhesives as will be discussed in greater detail below. As such, the first and second portions **18, 20** can be manufactured in a relatively efficient manner, and the spike **16** can be very durable. The materials of the first and second portions **18, 20** and the portions **18, 20** can be bonded together according to the teachings of U.S. Pat. No. 5,132,182, filed Feb. 21, 1991, issued Jul. 21, 1992, and claiming priority to DE 3818151, each of which is hereby incorporated by reference in its entirety.

Specific features of the first portion **18** will now be discussed. As shown in FIGS. 2 and 3, the first portion **18** can generally include a generally cylindrical base **22** with an outer surface **24**. The outer surface **24** can include an engagement member **26** for removably engaging with the sole **14** of the footwear **10**. In some embodiments, the engagement member **26** can be threading **28** such that the base **22** can be threadably attached to the sole **14** of the footwear **10**. It will be appreciated, however, that the engagement member **26** could be of any other type.

The first portion **18** can also include a flat, disc-shaped first flange **30**. The flange **30** can be centered on the base **22**

such that the flange **30** extends radially therefrom. The flange **30** can include a substantially flat first mating surface **32** that faces opposite the base **22**.

The second portion **20** can also include a substantially flat, disc-shaped second flange **34** having a second mating surface **35**. The second mating surface **35** can face the first mating surface **32** and can be chemically bonded thereto without separate adhesives.

The second portion **20** can also include a tapered member **36** that extends away from the first portion **18** and the second flange **34**. The tapered member **36** can be substantially centered on the second flange **34**. The tapered member **36** can have any shape, such as a substantially frusto-conic shape, and can terminate at a second end **38**. The width of the tapered member **36** can taper downward gradually in a direction from the first portion **18** to the second end **38**.

Also, the second portion **20** can include one or more (e.g., two) keying surfaces **39**. The keying surface **39** can be planar and can extend along the tapered member **36** perpendicularly from the second flange **34**. The keying surface **39** can provide a flat surface against which a tool (not shown) can abut for drivingly rotating the spike **16** about its longitudinal axis X during attachment and removal from the sole **14** of the footwear **10**.

Thus, the spike **16** can increase traction for the wearer of the footwear **10** by penetrating into a surface (grass, dirt, etc.). However, when treading on harder surfaces, such as concrete, the spike **16** may not penetrate. Nevertheless, the second portion **20** can resiliently compress such that traction is not reduced significantly. Also, the compression can absorb some shock loads to provide cushioned support on these harder surfaces. Moreover, the second portion **20** can resiliently recover once the wearer begins to tread on softer surfaces again such that the spike **16** can once again penetrate the softer surface. Furthermore, the first portion **18** can be rigid and hard to remain attached to the sole **14** of the footwear **10** despite this resilient deflection of the second portion **20**.

Referring now to FIG. 4, additional embodiments of the spike **116** will be discussed. Components of the spike **116** that correspond to the embodiments of FIGS. 2 and 3 are identified by corresponding reference numerals, increased by **100**.

As shown, the first portion **118** can include a base **122** and a first flange **130**, and the second portion **120** can include a second flange **134** and a tapered member **136**. In the embodiments shown, the second flange **134** can be partially embedded within the first flange **130**; however, in other embodiments, the first flange **130** can be embedded within the second flange **134**. As such, the mating surfaces **132, 135** can be non-planar.

Referring now to FIG. 5, additional embodiments of the spike **216** will be discussed. Components of the spike **216** that correspond to the embodiments of FIGS. 2 and 3 are identified by corresponding reference numerals, increased by **200**.

The embodiments of FIG. 5 can be substantially similar to those of FIG. 4. However, the second member **220** can include a second projection **240** that is integrally connected to the second flange **234** and the tapered member **236**. The second projection **240** can be substantially cylindrical with an annular rib **242** thereon. The annular rib **242** can extend continuously about the projection **240**. The second projection **240** can project from the second flange **234** and through the first flange **230** to be embedded within the base **222** of the first portion **218**. Thus, the mating surfaces **232, 235** can be defined between the first and second flanges **230, 234** as

well as between the second projection 240 and the base 222 of the first portion 218. Thus, there is increased surface area for bonding. Also, the rib 242 projects radially from the axis to thereby provide additional mechanical fixation between the first and second portions 218, 220.

Referring now to FIG. 6, additional embodiments of the spike 316 will be discussed. Components of the spike 316 that correspond to the embodiments of FIGS. 2 and 3 are identified by corresponding reference numerals, increased by 300.

As shown, the first portion 318 can include a first projection 344 that is dome shaped and that is integrally connected to the first flange 330 and the base 322. The first projection 344 can project from the first flange 330 to be embedded within the second portion 320. Thus, the mating surfaces 332, 335 can be defined between the first and second flanges 330, 334 as well as between the first projection 344 and the interior of the tapered member 336. Thus, there is increased surface area for bonding between the first and second portions 318, 320.

Referring now to FIG. 7, additional embodiments of the spike 416 will be discussed. Components of the spike 416 that correspond to the embodiments of FIGS. 2 and 3 are identified by corresponding reference numerals, increased by 400.

The embodiments of FIG. 7 can be substantially similar to those of FIG. 6. However, the first projection 444 can include one or more ribs 446 that extend radially therefrom. In the embodiments illustrated, there are a plurality of ribs 446 having generally triangular cross sections; however, the ribs 446 could have any suitable shape. The ribs 446 (ribbed mating surface) can increase the surface area of the mating surfaces 432, 435 between the first and second members 418, 420, to strengthen bonding between the first and second portions 418, 420. Also, it will be appreciated that the ribs 446 could be included on the second portion 420 and can be embedded in and bonded to the first portion 418 without departing from the scope of the present disclosure.

Referring now to FIG. 8, additional embodiments of the spike 516 are illustrated. Components of the spike 516 that correspond to the embodiments of FIGS. 2 and 3 are identified by corresponding reference numerals, increased by 500.

As shown, the first portion 518 can be substantially similar to the embodiments of FIG. 3. Also, the second portion 520 can include the second flange 534 with the mating surface 535 and an outer surface 550 that is opposite the mating surface 535. The second portion 520 can also include an annular ridge 552 that projects from a periphery of the outer surface 550 away from the first portion 518. Moreover, the second portion 520 can include a central projection 554 that is centered on the second flange 534 and that projects away from the first portion 518. The annular ridge 552 can continuously encircle the projection 554. Also, the central projection 554 can be conic or frusto-conic in shape.

Referring now to FIGS. 9A, 9B, and 10, a method of manufacturing the spikes 616 are illustrated according to exemplary embodiments. Components that correspond to the embodiments of FIGS. 2 and 3 are identified by corresponding reference numerals, increased by 600.

Generally, the spikes 616 can be formed via transfer compression molding and bonding the first and second portions 618, 620 together. As shown in FIG. 9A, a top, middle, and bottom plate 660, 670, 680 can be provided. The top plate 660 can include one or more (e.g., three) plungers 662 that project downwardly therefrom. The middle plate

670 can include a corresponding number of openings 664. The openings 664 can be shaped according to that of the plungers 662. The middle plate 670 can also include feed-through passages 666 that are fluidly connected to corresponding openings 664. The passages 666 can be much narrower than the openings 664. The middle plate 670 can further include mold cavities 668 that are in fluid connection with corresponding ones of the passages 666. The mold cavities 668 can be shaped according to the second portion 620 of the spikes 616. The bottom plate 680 can include receptacles 672 that are each shaped to receive and hold pre-formed first portions 618 of the spikes 616.

The first cavity portion 673 can be formed in an outer surface 675 of the bottom plate 680 and may be defined in part by a first peripheral sidewall 676 extending from the outer surface 675 to first lower surface 677. The second cavity portion 674 can be formed in the first lower surface 677 and may be defined in part by a second peripheral sidewall 678 extending from the first lower surface 677 to a second lower surface 679.

The first portions 618 can be formed by conventional injection molding processes and then positioned within respective receptacles 672 of the bottom plate 680. Then, the middle plate 670 can be mated against the bottom plate 680 (FIG. 9B), and flowable material 682 of the second portion 620 can be introduced into the openings 664. Then, as shown in FIG. 10, the top plate 660 can be mated against the middle plate 670 such that the plungers 662 push the material 682 into the mold cavity 668 (i.e., the material 682 can flow into the mold cavity 668). Upon curing, the first and second portions 618, 620 can be chemically bonded with each other, for instance, as described in U.S. Pat. No. 5,132,182, filed Feb. 21, 1991, issued Jul. 21, 1992, and claiming priority to DE 3818151, each of which is hereby incorporated by reference in its entirety. Then, the plates 660, 670, 680 can be separated, and the spikes 616 can be removed therefrom. Accordingly, the spikes 616 can be manufactured in an efficient, cost effective, and repeatable manner.

The foregoing description of the embodiments has been provided for purposes of illustration and description. It is not intended to be exhaustive or to limit the disclosure. Individual elements or features of a particular embodiment are generally not limited to that particular embodiment, but, where applicable, are interchangeable and can be used in a selected embodiment, even if not specifically shown or described. The same may also be varied in many ways. Such variations are not to be regarded as a departure from the disclosure, and all such modifications are intended to be included within the scope of the disclosure.

What is claimed is:

1. A method of manufacturing a cleat for an article of footwear, the method comprising:

- positioning a first cleat portion in a first mold cavity of a bottom mold plate having an outer surface, the first mold cavity including a first cavity portion and a second cavity portion in fluid communication with the first cavity portion, the first cavity portion formed in the outer surface, the second cavity portion extending from the first cavity portion into the bottom mold plate;
- moving a middle mold plate into contact with the bottom mold plate to define a second mold cavity between the middle mold plate and the bottom mold plate;
- moving a top mold plate toward the middle mold plate to flow a molding material through a portion of the middle mold plate and into the second mold cavity, the mold-

ing material substantially filling the second mold cavity and encapsulating a projection of the first cleat portion; and
 chemically bonding the first cleat portion and the molding material to form the cleat,
 wherein the first cavity portion has a greater cross-sectional area than the second cavity portion.

2. The method of claim 1, wherein positioning the first cleat portion in the first mold cavity includes positioning a flange portion of the first cleat portion in the first cavity portion and positioning an attachment feature of the first cleat portion in the second cavity portion, the attachment feature operable to removably attach the first cleat portion to the article of footwear.

3. The method of claim 2, wherein positioning the flange portion in the first cavity portion fluidly isolates the second cavity portion from the second mold cavity.

4. The method of claim 3, further comprising defining the second mold cavity between the flange portion and a void defined by the middle mold plate.

5. The method of claim 3, wherein flowing the molding material through a portion of the middle mold plate and into the second mold cavity causes the molding material to engage the flange portion.

6. The method of claim 1, further comprising providing the first cavity portion and the second cavity portion with a substantially cylindrical shape, the first cavity portion being concentric with and having a greater diameter than the second cavity portion.

7. The method of claim 1, further comprising solidifying the molding material to form a second cleat portion, the second cleat portion being less rigid than the first cleat portion.

8. The method of claim 1, wherein encapsulating a projection of the first cleat portion with the molding material includes encapsulating annular peaks and valleys formed in an outer surface of the projection.

9. A method of manufacturing a cleat for an article of footwear, the method comprising:
 positioning a first cleat portion in a first mold cavity of a bottom mold plate, the bottom mold plate having an outer surface, a first lower surface, and a second lower surface, the first lower surface disposed between the outer surface and the second lower surface, the first mold cavity having a first cavity portion and a second cavity portion, the first cavity portion formed in the outer surface of the bottom mold plate and defined in part by the first lower surface of the bottom mold plate, the first lower surface having a first cross-sectional area, the second cavity portion formed in the first lower surface and defined in part by the second lower surface of the bottom mold plate, the second lower surface having a second cross-sectional area smaller than the first cross-sectional area, the first cavity portion in fluid communication with the second cavity portion;
 moving a middle mold plate into contact with the bottom mold plate to define a second mold cavity between the middle mold plate and the first cleat portion;
 moving a top mold plate toward the middle mold plate to flow a molding material through a portion of the middle

mold plate and into the second mold cavity, the molding material substantially filling the second mold cavity and encapsulating a projection of the first cleat portion; and
 chemically bonding the first cleat portion and the molding material to form the cleat,
 wherein positioning the first cleat portion in the first mold cavity includes positioning the first cleat portion in the first cavity portion.

10. The method of claim 9, wherein positioning the first cleat portion in the first mold cavity includes positioning a flange portion of the first cleat portion in the first cavity portion and positioning an attachment feature of the first cleat portion in the second cavity portion, the attachment feature operable to removably attach the first cleat portion to the article of footwear.

11. The method of claim 10, wherein positioning the flange portion in the first cavity portion fluidly isolates the second cavity portion from the second mold cavity.

12. The method of claim 11, further comprising defining the second mold cavity between the flange portion and a void defined by the middle mold plate.

13. The method of claim 11, wherein flowing the molding material through a portion of the middle mold plate and into the second mold cavity causes the molding material to engage the flange portion.

14. The method of claim 9, further comprising providing the first cavity portion and the second cavity portion with a substantially cylindrical shape, the first cavity portion being concentric with and having a greater diameter than the second cavity portion.

15. The method of claim 9, further comprising solidifying the molding material to form a second cleat portion, the second cleat portion being less rigid than the first cleat portion.

16. The method of claim 9, wherein encapsulating a projection of the first cleat portion with the molding material includes encapsulating annular peaks and valleys formed in an outer surface of the projection.

17. The method of claim 1, wherein the outer surface of the bottom mold plate is disposed between the middle mold plate and the second cavity portion of the bottom mold plate.

18. The method of claim 9, wherein the outer surface of the bottom mold plate is disposed between the middle mold plate and the first lower surface of the bottom mold plate.

19. The method of claim 1, wherein the first cavity portion is defined in part by a first peripheral sidewall extending from the outer surface to a first lower surface, and the second cavity portion is defined in part by a second peripheral sidewall extending from the first lower surface to a second lower surface.

20. The method of claim 9, wherein the first cavity portion is defined in part by a first peripheral sidewall extending between the outer surface and the first lower surface, and the second cavity portion is defined in part by a second peripheral sidewall extending between the first lower surface and the second lower surface.

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